CLAIMS

1. A free curved surface precision machining tool for precision-machining a surface to be machined with the lower end in contact therewith by rotation around an axis z, comprising a drum-shaped tool having an orthogonal axis x orthogonal to the axis z and rotationally driven around the orthogonal axis x,

wherein the drum-shaped tool has a convex machining surface in the form of an arcuate rotary body obtained by rotating an arc of a radius r with the center at the intersection O between the axis z and the orthogonal axis x around the orthogonal axis x, whereby the convex machining surface contacts the surface to be machined to precision-machine the latter, while the convex machining surface is rotated around the orthogonal axis x so as to disperse the machining position of the convex machining surface.

2. The free curved surface precision machining tool according to claim 1, wherein the radius r is set smaller than the maximum radius R of the convex machining surface from the orthogonal axis x, whereby the position control of a machining trajectory is performed at the center O of rotation of the arc.

3. The free curved surface precision machining tool according to claim 1, wherein the radius r is set larger than the maximum radius R of the convex machining surface

from the orthogonal axis x, whereby the position control of a machining trajectory is performed at the center A of the lowest arc.

4. The free curved surface precision machining tool according to claim 1, wherein the convex machining surface of the drum-shaped tool is made of a grindstone or a cutter.

5. The free curved surface precision machining tool according to claim 4, wherein the grindstone includes a metal in its bonding material.

6. The free curved surface precision machining tool according to claim 1, further comprising a non-machining section for protecting the end of the convex machining surface without direct involvement in machining, the non-machining section being adjacent to the convex machining surface of the drum-shaped tool.

7. The free curved surface precision machining tool according to claim 6, wherein the non-machining section is made of material wearing out more easily than a grindstone bonding material so as not to damage the surface to be machined and includes a conductive material in its material.

8. The free curved surface precision machining tool according to claim 1, further comprising an impeller disposed on both sides or one side of the drum-shaped tool and a flow channel for emitting a jet of fluid to the impeller in the rotative direction, wherein the drum-

shaped tool is rotationally driven around the orthogonal axis x.

9. The free curved surface precision machining tool according to claim 1, further comprising a belt in contact with the outer peripheral surface of the drum-shaped tool and a pulley for holding the belt between the pulley and the drum-shaped tool, wherein the drum-shaped tool is rotationally driven around the orthogonal axis x by rotation of the belt.

10. The free curved surface precision machining tool according to claim 9, wherein the belt has a polishing surface on the side in contact with the outer peripheral surface so as to correct the convex machining surface of the drum-shaped tool as soon as the drum-shaped tool begins to be rotationally driven.

11. The free curved surface precision machining tool according to claim 6, further comprising a pulley in contact with the outer peripheral surface of the non-machining section and a belt for rotationally driving the pulley, wherein the drum-shaped tool is rotationally driven around the orthogonal axis x by rotation of the pulley.

12. The free curved surface precision machining tool according to claim 1, further comprising a driven gear disposed on both sides or one side of the drum-shaped tool and a main driving gear for driving the driven gear, wherein the main driving gear is belt-driven so as to

rotationally drive the drum-shaped tool around the orthogonal axis x.

13. The free curved surface precision machining tool according to claim 1, further comprising correction means for correcting the convex machining surface of the drum-shaped tool.

14. The free curved surface precision machining tool according to claim 13, wherein the correction means is formed of grindstone, electrolysis, or discharge means or combined means thereof.

15. The free curved surface precision machining tool according to claim 12, wherein the correction means functions simultaneously with the machining of material to be machined.